

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2000-188873

(43)Date of publication of application : 04.07.2000

(51)Int.Cl.

H02M 7/48

H02M 7/538

H05B 41/24

(21)Application number : 10-364049

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(22)Date of filing : 22.12.1998

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## (54) POWER UNIT

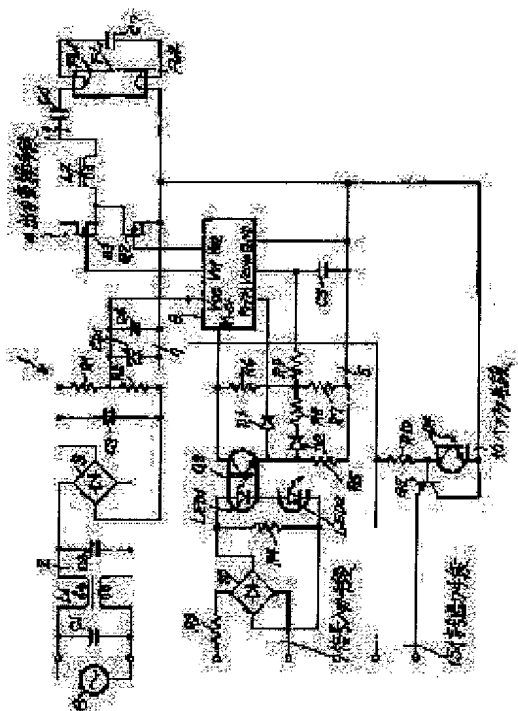
### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a power unit which can control a plurality of devices, even when the size or cost of the unit is not increased.

**SOLUTION:** A fluorescence lamp FL is turned on at a high frequency, by applying a high-frequency AC upon the lamp FL in accordance with the resonance characteristics of a choke coil L2 and a capacitor C7, in such a way that the AC voltage of commercial AC power supply (e) is full-wave rectified by means of a full-wave rectifier 3 and smoothed by means of a capacitor C3, and field effect transistors Q1 and Q2 are controlled by outputting rectangular waves from a microcomputer 8.

The output of an inverter circuit 4 is changed with a control signal inputted to a signal-inputting circuit 9.

Since the control signal corresponding to the control signal inputted to the signal inputting circuit 9 is outputted from a signal-inputting circuit 15 via a buffer circuit 16, it becomes unnecessary to turn the current of the control signal into a heavy current. Since the length of, for example, the signal line used in one device for connection can be shortened, the adverse effect of the distortion of signal or the resistance on the signal line can be prevented, and the control by means of the control signals can be made positively.



## LEGAL STATUS

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[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

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CLAIMS

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[Claim(s)]

[Claim 1] The power unit characterized by to provide an output conversion means output to a load circuit with the output adjustable, a signal input means input the control signal which sets up the output of this output conversion means, and a signal output means output the control signal corresponding to the control signal which has a buffer means and was inputted into said signal input means through this buffer means.

[Claim 2] A signal output means is a power unit according to claim 1 characterized by having an output waveform-shaping means.

[Claim 3] The power unit according to claim 1 or 2 characterized by providing a malfunction detection means to detect abnormalities, and the means for stopping which will stop the control signal from a signal output means if abnormalities are detected by this malfunction detection means.

[Claim 4] The power unit according to claim 3 characterized by providing an information means to report abnormalities for abnormalities to be detected by the malfunction detection means.

[Claim 5] It is the power unit according to claim 4 which a load circuit has a lamp and is characterized by an information means changing the lighting condition of a lamp, as for usual.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the power unit which carries out adjustable [ of the output ] with a control signal, and is outputted.

[0002]

[Description of the Prior Art] Conventionally, as this kind of a power unit, the electric-discharge lamp lighting device 1 shown in drawing 7 is known.

[0003] The input terminal of the full wave rectifier 3 with which a filter circuit 2 is connected to the commercial alternating current power source e, this filter circuit 2 has a capacitor C1, the common mode choke L1, and a capacitor C2, and the electric-discharge lamp lighting device 1 shown in this drawing 7 was constituted from a diode bridge as a rectification means by this filter circuit 2 is connected.

[0004] Moreover, in the output terminal of this full wave rectifier 3, the capacitor C3 for smooth is connected, the inverter circuit 4 of a half bridge type is connected to this capacitor C3, and this inverter circuit 4 has the series circuit of a field-effect transistor Q1 and a field-effect transistor Q2.

[0005] Furthermore, an inverter circuit 4 is controlled by the control circuit 5, and this control circuit 5 is controlled by the external dimmer 6. The series circuit of the resistance R1 for partial pressures and resistance R2 is connected to juxtaposition to a capacitor C3, and this control circuit 5 is the zener diode ZD1 for constant voltages to juxtaposition to resistance R2. And the capacitor C4 for smooth is connected, for example, the source 7 of a constant voltage of 12V is constituted, and it connects with the Vcc terminal of the microcomputer 8 for control.

[0006] Moreover, the external dimmer 6 is connected to the signal input circuit 9 as a signal input means, and, as for this signal input circuit 9, the input terminal of the full wave rectifier 10 for incorrect polarity connection prevention is connected through resistance R3. The parallel circuit of resistance R4 and light emitting diode LED1 is connected to the output terminal of this full wave rectifier 10. And photograph coupling of the photo transistor Q3 is carried out to this light emitting diode LED1, this photo transistor Q3 minds resistance R5, and it is Vref of 5V of a microcomputer 8. It connects with a terminal and a GND terminal, and the emitter of a photo transistor Q3 is connected to the PWM terminal through diode D1. Moreover, Vref of a microcomputer 8 Between a terminal and a GND terminal, the series circuit of resistance R6 and resistance R7 is connected. The emitter of a photo transistor Q3 It connects through diode D2 and the series circuit of resistance R8 at the node of resistance R6 and resistance R7, the node of resistance R6 and resistance R7 minds resistance R9, and it is VCOM. It connects with a terminal and is Vcom. The capacitor C5 is connected between the terminal and the GND terminal.

[0007] Furthermore, V01 terminal is connected to the gate of a field-effect transistor Q1, and V02 terminal is connected to the gate of a field-effect transistor Q2.

[0008] Moreover, the load circuit 11 is connected to the field-effect transistor Q2. This load circuit 11 minds a choke coil L2 and the capacitor C6 for a direct-current cut between the drain of a field-effect transistor Q2, and the source, and they are the filaments [ floor line / floor line and / 2 ] 1 of fluorescent

lamp floor line as a discharge lamp. It connects with an end and they are these filaments [ floor line / floor line and / 2 ] 1. The capacitor C7 for resonance is connected to the other end.

[0009] Furthermore, as shown in drawing 8 , multidrop wiring of about dozens of sets of the electric-discharge lamp lighting devices 1 is carried out at the external dimmer 6.

[0010] And full wave rectification of the alternating voltage of the commercial alternating current power source e is carried out with a full wave rectifier 3, smooth is carried out by the capacitor C3, from a microcomputer 8, a square wave is outputted, a field-effect transistor Q1 and a field-effect transistor Q2 are controlled, high-frequency ac is impressed to fluorescent lamp floor line according to the resonance characteristic of a choke coil L2 and a capacitor C7, and RF lighting of the fluorescent lamp floor line is carried out.

[0011] Moreover, the control signal of PWM is outputted from the external dimmer 6, if light emitting diode LED1 is made to emit light when it rectifies so that a problem may not arise, and H level signal is inputted and light emitting diode LED1 emits light even if it connects with which polarity so that it may not become incorrect polarity connection with a full wave rectifier 10, a photo transistor Q3 turns on, a capacitor C3 is charged, and it is Vcon. The electrical potential difference of a capacitor C3 is impressed to a terminal. Moreover, this Vcon If the electrical potential difference impressed to a terminal is high, it will turn on, a microcomputer 8 will carry out off switching operation of a field-effect transistor Q1 and the field-effect transistor Q2 so that the frequency of an inverter circuit 4 may become high, and the output of an inverter circuit 4 will be reduced.

[0012] That is, the output of an inverter circuit 4 is reduced, so that the on-duty of the control signal of PWM is large, and on the contrary, the output of an inverter circuit 4 becomes large, so that on-duty is small.

[0013] Moreover, if the electrical potential difference inputted into an PWM terminal becomes beyond a threshold, actuation of an inverter circuit 4 is stopped and fluorescent lamp floor line is made to switch off.

[0014] however -- enlarging the current of the external dimmer 6, in controlling the electric-discharge lamp lighting device 1 of the number beyond this of what can connect about dozens of sets of the electric-discharge lamp lighting devices 1 to one external dimmer 6 as mentioned above \*\*\*\* -- or the external dimmer 6 -- two or more -- using -- the whole electric-discharge lamp lighting device 1 -- it is necessary to control -- enlargement -- or it becomes expensive.

[0015] Moreover, in connecting hundreds of sets of the electric-discharge lamp lighting devices 1 to one external dimmer 6, for example, as shown in drawing 9 , the signal amplifier 12 was connected to the external dimmer 6, and it has connected with the electric-discharge lamp lighting device 1 through this signal amplifier 12.

[0016] However, if the number which the electric-discharge lamp lighting device 1 connects is made to increase, it will become impossible to disregard the effect of the signal-line resistance by having enlarged the signal output, and contact resistance, a signal level will decline, and it will be hard coming for the path of a signal line to become long and for electrostatic capacity to increase by the increment in the path of a signal line, and to distort a signal wave form or to operate normally.

[0017] Moreover, when short circuit wiring is carried out on the occasion of construction, the electric-discharge lamp lighting device 1 does not operate normally, but it is hard to pinpoint an abnormality part, an overcurrent flows to the external dimmer 6, and there is a possibility that the external dimmer 6 may be damaged.

[0018]

[Problem(s) to be Solved by the Invention] as mentioned above -- enlarging the current of the external dimmer 6, in controlling the electric-discharge lamp lighting device 1 of the number beyond this of what can connect about dozens of sets of the electric-discharge lamp lighting devices 1 to one external dimmer 6 to be shown in drawing 8 \*\*\*\* -- or the external dimmer 6 -- two or more -- using -- the whole electric-discharge lamp lighting device 1 -- it is necessary to control -- enlargement -- or it becomes expensive.

[0019] Moreover, if the signal amplifier 12 is connected to the external dimmer 6 and it connects with

the electric-discharge lamp lighting device 1 through this signal amplifier 12 as shown in drawing 9, the path of a signal line becomes long, and electrostatic capacity increases by the increment in the path of a signal line, and a signal wave form is distorted or it has [ it becomes impossible to disregard the effect of the signal-line resistance by having enlarged the signal output, and contact resistance, a signal level declines, and ] the problem which stops being able to operate easily normally.

[0020] This invention was made in view of the above-mentioned trouble, and it aims at offering the power unit which can control two or more equipments, without enlarging equipment or making it expensive.

[0021]

[Means for Solving the Problem] An output conversion means to output a power unit according to claim 1 to a load circuit with the output adjustable, A signal input means to input the control signal which sets up the output of this output conversion means, It is a thing possessing a signal output means to output the control signal corresponding to the control signal which has a buffer means and was inputted into said signal input means through this buffer means. While carrying out adjustable [ of the output of an output conversion means ] with the control signal inputted into the signal input means Since the control signal corresponding to a control signal is outputted from a signal output means through a buffer means, while it becomes unnecessary to make the current of a control signal into a high current Since the die length of the signal line for [ which is used with one equipment ] connecting can be shortened, a signal can be distorted, or the bad influence by resistance of a signal line can be prevented, and control by the control signal becomes certain.

[0022] In order that a power unit according to claim 2 may operate orthopedically the output wave of the control signal which a signal output means has an output waveform-shaping means, and is outputted in a power unit according to claim 1 with an output waveform-shaping means, a control signal becomes exact and control by the control signal becomes certain.

[0023] A power unit according to claim 3 is a thing possessing a malfunction detection means to detect abnormalities, and the means for stopping which will stop the control signal from a signal output means if abnormalities are detected by this malfunction detection means in a power unit according to claim 1 or 2, and if abnormalities are detected by the malfunction detection means, in order to stop the control signal from an output signal means by the means for stopping, it prevents making it operate at the time of abnormalities.

[0024] In a power unit according to claim 3, a power unit according to claim 4 is a thing possessing an information means to report abnormalities for abnormalities to be detected by the malfunction detection means, and when abnormalities arise, it understands abnormalities easily with an information means.

[0025] As for a load circuit, a power unit according to claim 5 has a lamp in a power unit according to claim 4, and an information means changes the lighting condition of a lamp with usual, and understands abnormalities easily with the lamp of a load circuit.

[0026]

[Embodiment of the Invention] Hereafter, the lighting system of the gestalt of 1 operation of this invention is explained with reference to a drawing. In addition, the part explained in the conventional example shown in drawing 7 thru/or drawing 9 attaches and explains the same sign.

[0027] The input terminal of the full wave rectifier 3 with which a filter circuit 2 is connected to the commercial alternating current power source e, this filter circuit 2 has a capacitor C1, the common mode choke L1, and a capacitor C2, and the electric-discharge lamp lighting device 1 shown in drawing 1 was constituted from a diode bridge as a rectification means by this filter circuit 2 is connected.

[0028] Moreover, in the output terminal of this full wave rectifier 3, the capacitor C3 for smooth is connected, the inverter circuit 4 as an output conversion means of a half bridge type is connected to this capacitor C3, and this inverter circuit 4 has the series circuit of a field-effect transistor Q1 and a field-effect transistor Q2.

[0029] Furthermore, an inverter circuit 4 is controlled by the control circuit 5, and this control circuit 5 is controlled by the external dimmer 6. The series circuit of the resistance R1 for partial pressures and resistance R2 is connected to juxtaposition to a capacitor C3, and this control circuit 5 is the zener diode

ZD1 for constant voltages to juxtaposition to resistance R2. And the capacitor C4 for smooth is connected, for example, the source 7 of a constant voltage of 12V is constituted, and it connects with the Vcc terminal of the microcomputer 8 for control.

[0030] Moreover, the external dimmer 6 is connected to the signal input circuit 9 as a signal input means, and, as for this signal input circuit 9, the input terminal of the full wave rectifier 10 for incorrect polarity connection prevention is connected through resistance R3. The series circuit of resistance R4, light emitting diode LED1, and light emitting diode LED2 is connected to juxtaposition at the output terminal of this full wave rectifier 10. And photograph coupling of the photo transistor Q3 is carried out to this light emitting diode LED1, this photo transistor Q3 minds resistance R5, and it is Vref of 5V of a microcomputer 8. It connects with a terminal and a GND terminal, and the emitter of a photo transistor Q3 is connected to the PWM terminal through diode D1. Moreover, Vref of a microcomputer 8 Between a terminal and a GND terminal, the series circuit of resistance R6 and resistance R7 is connected. The emitter of a photo transistor Q3 It connects through diode D2 and the series circuit of resistance R8 at the node of resistance R6 and resistance R7, the node of resistance R6 and resistance R7 minds resistance R9, and it is VCOM. It connects with a terminal and is Vcom. The capacitor C5 is connected between the terminal and the GND terminal.

[0031] Furthermore, V01 terminal is connected to the gate of a field-effect transistor Q1, and V02 terminal is connected to the gate of a field-effect transistor Q2.

[0032] Moreover, among the both-ends children of the capacitor C4 of the source 7 of a constant voltage, the signal output circuit 15 as a signal output means is connected, and this signal output circuit 15 is resistance R10. And the photo transistor Q4 from which photograph coupling is carried out to light emitting diode LED2 and which the buffer circuit 16 as a buffer means consists of is connected to a serial, and the base and the collector of a transistor Q5 are connected to the collector of this photo transistor Q4, and the emitter.

[0033] Furthermore, the load circuit 11 is connected to the field-effect transistor Q2. This load circuit 11 minds a choke coil L2 and the capacitor C6 for a direct-current cut between the drain of a field-effect transistor Q2, and the source, and they are the filaments [ floor line / floor line and / 2 ] 1 of fluorescent lamp floor line as a discharge lamp. It connects with an end and they are these filaments [ floor line / floor line and / 2 ] 1. In the other end, they are these filaments [ floor line / floor line and / 2 ] 1. While becoming hot beforehand, the capacitor C7 for resonance is connected.

[0034] Furthermore, as shown in drawing 2, the signal input circuit 9 of the electric-discharge lamp lighting device 1 is connected, the signal output circuit 15 of this electric-discharge lamp lighting device 1 is connected to the signal input circuit 9 of the following electric-discharge lamp lighting device 1, this is repeated to the external dimmer 6, and series connection of the electric-discharge lamp lighting device 1 is carried out to it one by one.

[0035] Next, actuation of the gestalt of the above-mentioned implementation is explained.

[0036] First, full wave rectification of the alternating voltage of the commercial alternating current power source e is carried out with a full wave rectifier 3, smooth is carried out by the capacitor C3, from a microcomputer 8, a square wave is outputted, a field-effect transistor Q1 and a field-effect transistor Q2 are controlled, high-frequency ac is impressed to fluorescent lamp floor line according to the resonance characteristic of a choke coil L2 and a capacitor C7, and RF lighting of the fluorescent lamp floor line is carried out.

[0037] Moreover, if the control signal of PWM is outputted from the external dimmer 6, it rectifies in order to prevent being damaged even if it connects with which polarity so that it may not become incorrect polarity connection with a full wave rectifier 10, and H level signal is inputted If light emitting diode LED1 is made to emit light and light emitting diode LED1 emits light, a photo transistor Q3 turns on, and it pressures partially by resistance R5 thru/or resistance R8, smooth is carried out by \*\*\*\*\* and the capacitor C3 by resistance R9, and it is Vcon. The electrical potential difference of a capacitor C3 is impressed to a terminal. Moreover, this Vcon If the electrical potential difference impressed to a terminal is high, it will turn on, a microcomputer 8 will carry out off switching operation of a field-effect transistor Q1 and the field-effect transistor Q2 so that the frequency of an inverter circuit 4 may become

high, and the output of an inverter circuit 4 will be reduced. By changing the switching frequency of a field-effect transistor Q1 and a field-effect transistor Q2, the resonance characteristic of a choke coil L2 and a capacitor C7 changes, and an inverter circuit 4 modulates the light of fluorescent lamp floor line. [0038] That is, when the on-duty of the control signal of PWM is 100% greatly, an average electrical potential difference is set to 12V, the output of an inverter circuit 4 is reduced most, on the contrary, when on-duty is 0% small, an average electrical potential difference is set to 0V, and the output of an inverter circuit 4 becomes large most.

[0039] Furthermore, while light emitting diode LED1 emits light, light emitting diode LED2 emits light, a photo transistor Q4 turns on and a transistor Q5 turns on, and from this signal output circuit 15, the same signal as the control signal of PWM inputted into the signal input circuit 9 of this electric-discharge lamp lighting device 1 is outputted, and it is inputted into the signal input circuit 9 of the following electric-discharge lamp lighting device 1. In addition, since the control signal of the small current only for one set of the following electric-discharge lamp lighting device 1 is outputted through a buffer circuit 16, amplifier etc. becomes unnecessary and the limit of load-carrying capacity of it is lost. Moreover, direct continuation of the front electric-discharge lamp lighting device 1 is not electrically carried out for the signal line with the following electric-discharge lamp lighting device 1. The source 7 of a constant voltage of the electric-discharge lamp lighting device 1 is newly used as a power source. A boost, i.e., since current amplification will be carried out and it will output to the following electric-discharge lamp lighting device 1, Can also complement attenuation of a control signal, a sequential-control signal is made sent, without enlarging the current of a signal, and without resistance or contact resistance of a signal line becoming a problem, since a control signal is not distorted, regardless of the number of the electric-discharge lamp lighting devices 1, it can control by one external dimmer 6.

[0040] Moreover, if the electrical potential difference inputted into an PWM terminal becomes beyond a threshold, actuation of an inverter circuit 4 is stopped and fluorescent lamp floor line is made to switch off.

[0041] Next, the gestalt of other operations is explained with reference to drawing 3 .

[0042] In the electric-discharge lamp lighting device 1 which shows the electric-discharge lamp lighting device 1 shown in this drawing 3 to drawing 1 , it connects with the emitter of the photo transistor Q4 of a buffer circuit 16 at the non-inversed input terminal of the comparator 17 as an output waveform-shaping means, the inversed input terminal of this comparator 17 is connected to the source 7 of a constant voltage, and the output terminal is connected to the base of a transistor Q6.

[0043] And although fundamental actuation is the same as that of the electric-discharge lamp lighting device 1 shown in drawing 1 When the control signal inputted into the signal input circuit 9 is H level, light emitting diode LED2 emits light. Only when a photo transistor Q4 turns on and this photo transistor Q4 to which the electrical potential difference of a non-inversed input terminal becomes high from the inversed input terminal which is reference voltage turns on, a comparator 17 outputs. The signal output circuit 15 outputs Vcc which is H level, and when a control signal is L level, light emitting diode LED2 does not emit light. A photo transistor Q4 does not turn on, and a comparator 17 is not outputted when the photo transistor Q4 to which the electrical potential difference of a non-inversed input terminal becomes low from the inversed input terminal which is reference voltage turns off. The signal output circuit 15 outputs 0V which are L level, is in the condition that waveform distortion was taken and the wave was operated orthopedically, and outputs the control signal corresponding to the control signal inputted into the signal input circuit 9 from the signal output circuit 15.

[0044] Thus, the control signal outputted when the control signal of PWM inputted is H level is Vcc, and the control signal outputted when the control signal of PWM inputted is L level removes distortion of the control signal outputted, even if distortion has arisen in the control signal by being referred to as 0 with the stray capacity of the nonlinearity of for example, a transfer component, or a signal line. Therefore, it is stabilized also to a disturbance noise and the die length of the signal line which connects the following electric-discharge lamp lighting device 1 can also be lengthened.

[0045] Next, the gestalt of other operations is explained with reference to drawing 4 .

[0046] In the electric-discharge lamp lighting device 1 which shows the electric-discharge lamp lighting



device 1 shown in this drawing 4 to drawing 1 The malfunction detection means 18 is formed in the signal output circuit 15. This malfunction detection means 18 between the collector of a transistor Q5, and the emitter of a photo transistor Q4 Shunt resistance R11 It connects and is this shunt resistance R11. Zener diode ZD2 And relay Ry1 A relay coil Ry1L is connected and it is this relay Ry1. Relay contact Ry1S1 It connects with the base of a transistor Q5.

[0047] And although fundamental actuation is the same as that of the electric-discharge lamp lighting device 1 shown in drawing 1 When overcurrents, such as a short-circuit current, flow to the signal line of the signal output circuit 15, it is the shunt resistance R11. An electrical potential difference rises and it is zener diode ZD2. It turns on. A current flows to relay coil Ry1L, and it is relay contact Ry1S1. Kaisei is carried out, a transistor Q5 does not turn on, and even if a control signal is inputted into the signal input circuit 9, a signal is not outputted from the signal output circuit 15.

[0048] Since a control signal will not be outputted if the signal line to the following electric-discharge lamp lighting device 1 or the following electric-discharge lamp lighting device 1 is unusual while protecting the following electric-discharge lamp lighting device 1 etc., in order to stop the output of a control signal, if it follows, for example, overcurrents, such as a short-circuit current, flow to an output side by the abnormalities of the circuit of wiring or the following electric-discharge lamp lighting device 1, or the excess of the amount of connection, pinpointing of an abnormality part becomes easy.

[0049] Furthermore, the gestalt of other operations is explained with reference to drawing 5.

[0050] The electric-discharge lamp lighting device 1 shown in this drawing 5 is the relay coil Ry 1L2 which operates by relay coil Ry1L in the electric-discharge lamp lighting device 1 shown in drawing 4. Vref of a microcomputer 8 It connects between a terminal and an PWM terminal, and fluorescent lamp floor line is operated as an information means.

[0051] And shunt resistance R11 If an overcurrent etc. is detected, while stopping the output of a control signal, it is Vref of a microcomputer 8. Between a terminal and an PWM terminal is short-circuited, and actuation of an inverter circuit 4 is stopped. Thus, since lighting of fluorescent lamp floor line is stopped by stopping actuation of an inverter circuit 4, abnormalities can be known easily.

[0052] Furthermore, the gestalt of other operations is explained with reference to drawing 6.

[0053] It sets to the electric-discharge lamp lighting device 1 shown in drawing 4, and the electric-discharge lamp lighting device 1 shown in this drawing 6 is a timer circuit 19 and relay Ry2 to juxtaposition to relay coil Ry1L. While connecting the series circuit of relay coil Ry2L, it is Vref of a microcomputer 8 about relay contact Ry2S. It connects between a terminal and an PWM terminal, and fluorescent lamp floor line is operated as an information means.

[0054] And shunt resistance R11 If an overcurrent etc. is detected, while stopping the output of a control signal, a current is supplied to relay coil Ry2L for every predetermined time in a timer circuit 19, and it is Vref of a microcomputer 8 for every predetermined time. Between a terminal and an PWM terminal is short-circuited, and actuation of an inverter circuit 4 is stopped for every predetermined time. Thus, since fluorescent lamp floor line is blinked by stopping actuation of an inverter circuit 4 for every predetermined time, abnormalities can be known easily.

[0055]

[Effect of the Invention] While carrying out adjustable [ of the output of an output conversion means ] with the control signal inputted into the signal input means according to the power unit according to claim 1 Since the control signal corresponding to a control signal is outputted from a signal output means through a buffer means, while it becomes unnecessary to make the current of a control signal into a high current Since the die length of the signal line for [ which is used with one equipment ] connecting can be shortened, a signal can be distorted, or the bad influence by resistance of a signal line can be prevented, and control by the control signal can be ensured.

[0056] Since according to the power unit according to claim 2 a signal output means has an output waveform-shaping means in addition to a power unit according to claim 1 and the output wave of the control signal to output is orthopedically operated with an output waveform-shaping means, a control signal becomes exact and control by the control signal can be ensured.

[0057] If abnormalities are detected by the malfunction detection means in addition to a power unit

according to claim 1 or 2, since the control signal from an output signal means will be stopped by the means for stopping according to the power unit according to claim 3, it can prevent making it operate at the time of abnormalities.

[0058] Since an information means to report abnormalities for abnormalities to be detected by the malfunction detection means was provided [ according to the power unit according to claim 4 ] in addition to the power unit according to claim 3, if abnormalities arise, abnormalities can be known with an information means.

[0059] Since according to the power unit according to claim 5 in addition to a power unit according to claim 4 a load circuit has a lamp and an information means changes the lighting condition of a lamp with usual, abnormalities can know with the lamp of a load circuit.

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[Translation done.]

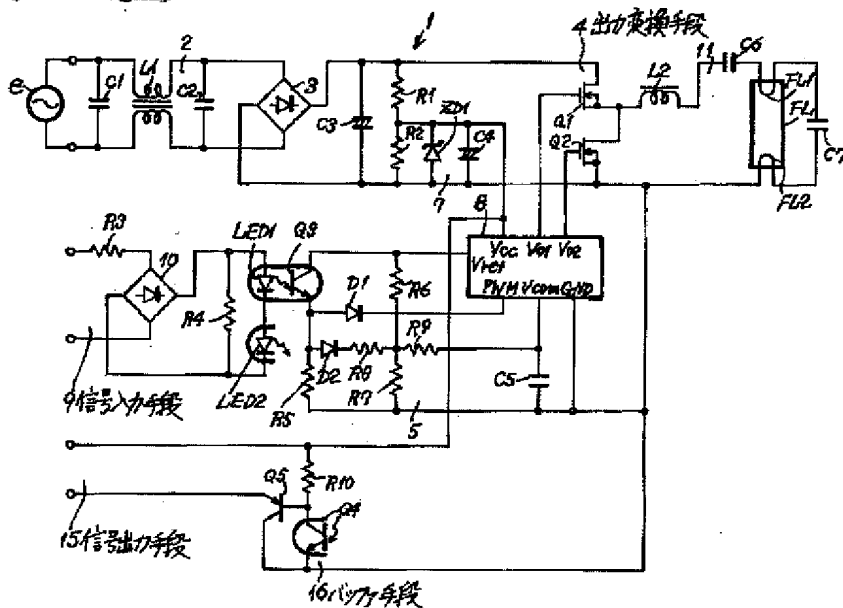
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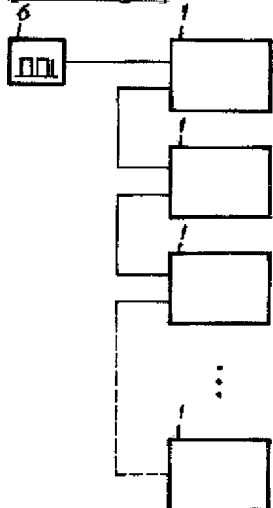
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## DRAWINGS

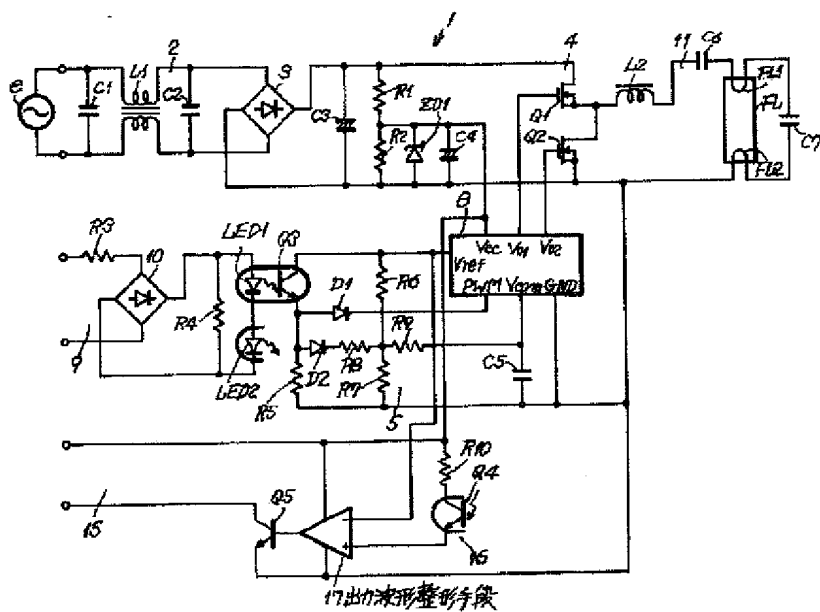
[Drawing 1]



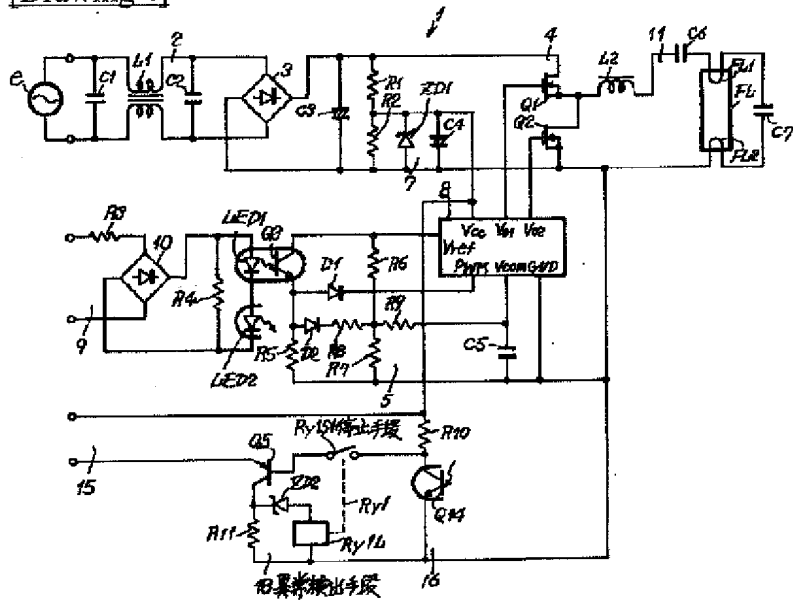
[Drawing 2]



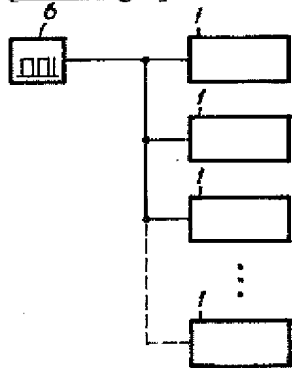
[Drawing 3]



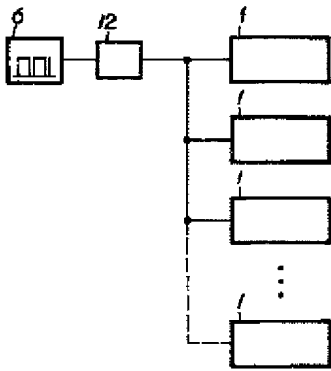
[Drawing 4]



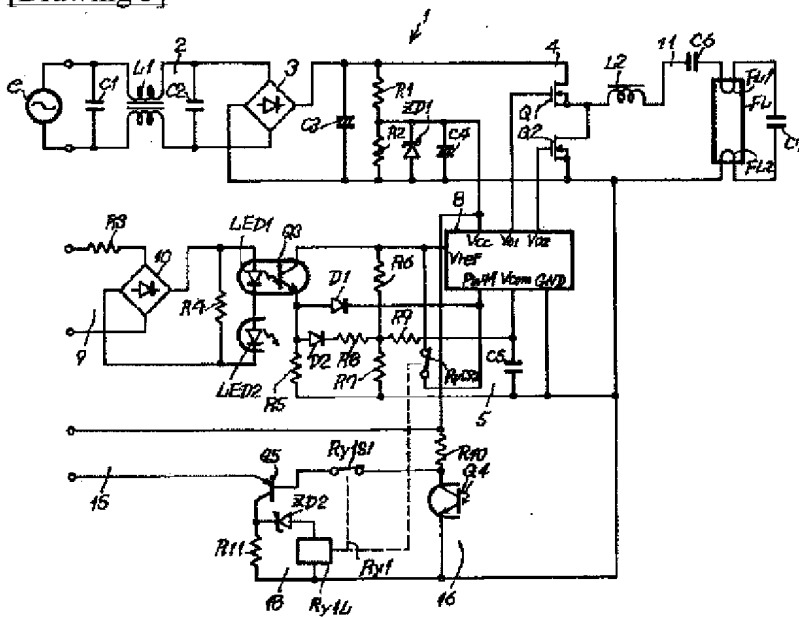
[Drawing 8]



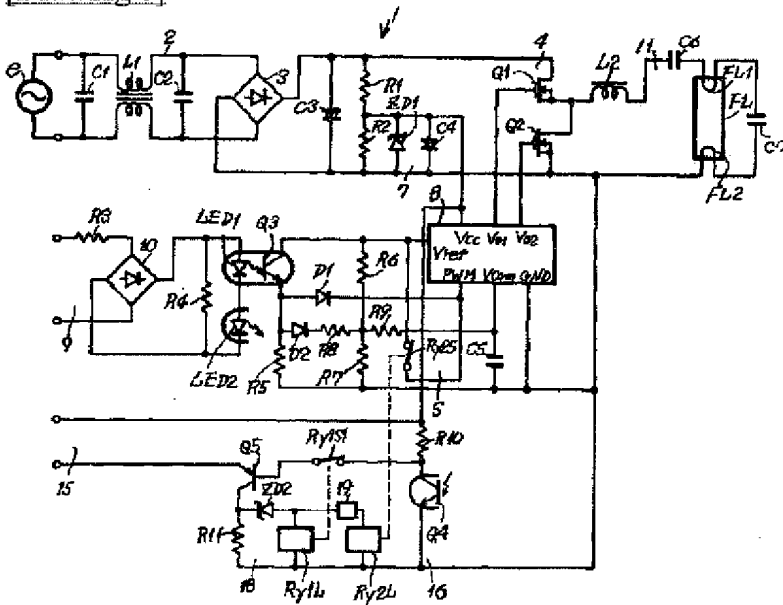
[Drawing 9]



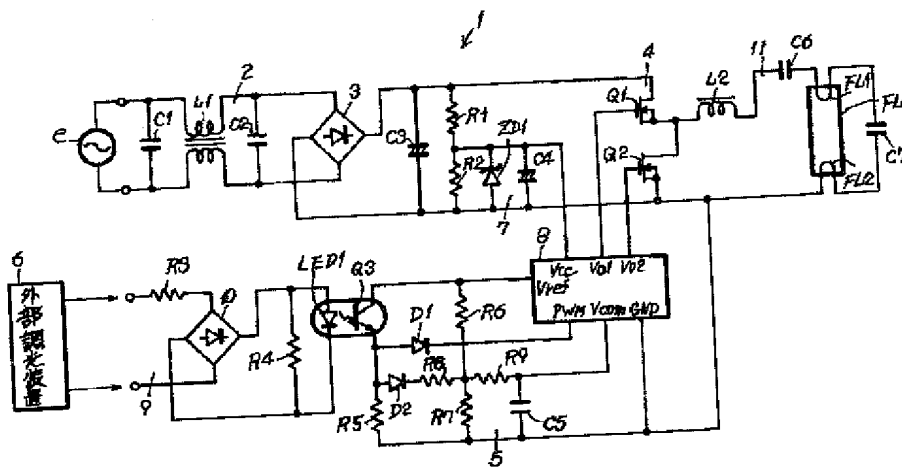
[Drawing 5]



[Drawing 6]



[Drawing 7]



[Translation done.]